

REMARKS**INTRODUCTION:**

In accordance with the foregoing, claims 1, 4, 5, 6, 8, 15, 19, 24, 27, 28, 30, 32, 34, and 35 have been amended. No new matter is being presented, and approval and entry are respectfully requested.

Claims 1, 4-6, 8-11, 13-15, 17-22, 24-28, 30-32, 34 and 35 are pending and under consideration. Reconsideration is respectfully requested.

CLAIM OBJECTIONS:

In the Office Action, at pages 3 and 4, claims 5, 19, 30, and 34 were rejected under 37 CFR 1.75(c), for the reasons set forth therein. This rejection is traversed and reconsideration is requested.

The courts have held that, when the term “comprising” or “comprises” is utilized, further elements may be recited, as noted in Phillips Petroleum Co. v. Huntsman Polymers Corp., 157 F.3d 866, 874, 48 USPQ2d 1161, 1167 (Fed. Cir. 1998) (“The use of . . . ‘which comprises’ in the composition and process claims generally would mean that the claims require [the recited limitations], but that additional elements or process steps may be present.”); Genentech, Inc. v. Chiron Corp., 112 F.3d 495, 501, 42 USPQ2d 1608, 1613 (Fed. Cir. 1997) (“‘Comprising’ is a term of art used in claim language which means that the named elements are essential, but other elements may be added and still form a construct within the scope of the claim.”).

Claim 5 was amended to recite: “The positive active material composition of claim 1, wherein: the binder further comprises at least one first polymer selected from the group consisting of polyvinylidene fluoride and polyvinyl acetate; the organic mixing solvent is a first organic mixing solvent which dissolves the first polymer and further comprises an organic solvent selected from the group consisting of dimethylformamide and acetonitrile; the positive active material composition further comprises: at least one oxide polymer selected from the group consisting of polyethylene oxide and polypropylene oxide; and a second organic mixing solvent which dissolves the oxide polymer and is selected from the group consisting of 1,3-dioxolane and acetonitrile.” Thus, claim 5 has been amended to recite additional elements, which is submitted to be allowable when using the terminology “comprises.”

Claim 19 has been amended to recite: “The lithium-sulfur of claim 15, wherein the electrolyte-organic solvent further comprises an organic solvent selected from the group consisting of benzene, fluorobenzene, toluene, trifluorotoluene, xylene, cyclohexane,

tetrahydrofuran, 2-methyl tetrahydrofuran, cyclohexanone, ethanol, isopropyl alcohol, dimethyl carbonate, ethylmethyl carbonate, diethyl carbonate, methylpropyl carbonate, methyl propionate, ethyl propionate, methyl acetate, ethyl acetate, propyl acetate, dimethoxy ethane, 1,3-dioxolane, diglyme, tetraglyme, ethylene carbonate, propylene carbonate, γ -butyrolactone and sulfolane." Thus, claim 19 has been amended to recite additional elements, which is submitted to be allowable when using the terminology "comprises."

Claim 30 has been amended to recite: "The method of claim 28, wherein the organic mixing solvent further includes an organic solvent selected from the group consisting of dimethylformamide and acetonitrile." Thus, claim 30 has been amended to recite additional elements, which is submitted to be allowable when using the terminology "comprises."

Claim 34 has been amended to recite: "The method of claim 32, wherein the organic mixing solvent further comprises an organic solvent selected from the group consisting of dimethylformamide and acetonitrile." Thus, claim 34 has been amended to recite additional elements, which is submitted to be allowable when using the terminology "comprises."

Thus, amended claims 5, 19, 30 and 34 are now submitted to be in proper form under 37 CFR 1.75(c).

REJECTION UNDER 35 U.S.C. §112:

In the Office Action, at page 3, claims 5, 6, 8, 19, 30, and 34 were rejected under 35 U.S.C. §112, second paragraph, for the reasons set forth therein. This rejection is traversed and reconsideration is requested.

Claim 5 has been amended as noted above, and is now believed to be clear under 35 U.S.C. §112, second paragraph.

Claim 6 has been amended to recite: "The positive active material composition of claim 1, wherein the binder further comprises polyvinylidene fluoride, and the organic mixing solvent further comprises dimethyl formamide," and is now believed to be clear under 35 U.S.C. §112, second paragraph.

Claim 8 has been amended to recite: "The positive active material composition of claim 1, wherein the binder further comprises polyvinylacetate and the organic mixing solvent further comprises acetonitrile," and is now believed to be clear under 35 U.S.C. §112, second paragraph.

Claims 19, 30 and 34 have been amended as noted above, and are now believed to be clear under 35 U.S.C. §112, second paragraph.

REJECTION UNDER 35 U.S.C. §103:

A. In the Office Action, at page 3, claims 1, 4-5, 9-11, 14, 15, 17-22, and 24-27 were rejected under 35 U.S.C. §103(a) as being unpatentable over Geronov et al. (USPN 6,344,293; hereafter, Geronov) in view of Takezawa et al. (USPN 6,733,927; hereafter, Takezawa). The reasons for the rejection are set forth in the Office Action and therefore not repeated. The rejection is traversed and reconsideration is requested.

Independent claim 1, and independent claims 15, 24 and 27 in similar fashion, have been amended to recite that the organic mixing solvent is non-aqueous and has a solubility of sulfur equal to or less than 50 mM, which is not taught or suggested by Geronov or Takezawa, alone or in combination.

As pointed out in the Response filed July 1, 2004, Geronov teaches that it is necessary to use water in the electrolyte (see independent claims 1, 19, 20, 21, 22, 23, and 28) of the electrochemical cell to enhance cycle life, which is not recited in the specification or claims of the present application. Thus, Geronov teaches away from the present invention with respect to the electrolyte.

As noted in the specification, the present invention possesses unexpectedly improved properties (paragraph 22, page 5):

The requirements for the organic mixing solvent are a good ability to dissolve the binder, a low boiling point and, more importantly, a low sulfur solubility. If an organic mixing solvent having a high sulfur solubility is used, the dissolved sulfur with a high specific gravity (D=2.07) may sink to the bottom of the coated slurry and finally to the current collector forming the insulating layer between the composition and current collector during the drying process, which causes poor ionic conductivity. An example of polyvinylidene fluoride may be taken. Conventionally, polyvinylidene fluoride is used in lithium-ion batteries. But one should be careful when it is used in lithium-sulfur batteries. This is because a sulfur active material is good soluble in N-methyl pyrrolidone which is a good solvent to polyvinylidene fluoride. If we used the polyvinylidene fluoride with the N-methyl pyrrolidone as a mixing solvent, the cell does not work well because dissolved sulfur forms the insulating layer between the conductive agents and between the composition and the current collector. Thus, the choice of the binder and its organic mixing solvent is critical to a lithium-sulfur battery exhibiting good battery performance. (emphasis added)

Note that no water is utilized, as is used in Geronov. The solvent used is critical, and it is known to those skilled in the art the water is a non-organic solvent having ionic properties, and that organic solvents, such as the solvents used in the present invention, are typically non-ionic. Hence, the present invention possesses unexpectedly improved properties that the prior art

does not have, and the prior art is so deficient that there is no motivation to make what might otherwise appear to be obvious changes, or any other argument . . . that is pertinent." Dillon, 919 F.2d at 692-93.

Since Geronov teaches the use of water in the solvent, although Takezawa mentions a possibility of using polyvinylidene fluoride and polyvinyl pyrrolidone as solvents, Takezawa does not teach a functional equivalent for the solvent of Geronov. Hence, it is respectfully submitted that one of skill in the art would not have been motivated to combine these references in a manner that rendered the claimed invention obvious. Indeed, the Examiner did not identify any motivation to choose these references for combination. Geronov does not specifically teach use of polyvinyl pyrrolidone as a binder. In fact, Geronov teaches using water as a solvent, which is contrary to the type of solvent used in the present invention. In addition, Geronov does not teach the choice of an organic mixing solvent having a solubility of sulfur equal to or less than 50 mM. Clearly one skilled in the art knows that using an organic solvent without water and an organic solvent together with water provide different solubility characteristics. The Examiner provides no reasons that one of ordinary skill in this art, seeking to improve the battery performance, would combine Geronov with Takezawa in a manner that would eliminate water as part of the solvent and that would render the claimed invention obvious.

As this court has stated, "virtually all [inventions] are combinations of old elements." Environmental Designs, Ltd. v. Union Oil Co., 713 F.2d 693, 698, 218 USPQ 865, 870 (Fed. Cir. 1983); see also Richdel, Inc. v. Sunspool Corp., 714 F.2d 1573, 1579-80, 219 USPQ 8, 12 (Fed. Cir. 1983) ("Most, if not all, inventions are combinations and mostly of old elements."). Therefore an Examiner may often find every element of a claimed invention in the prior art. If identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue. Furthermore, rejecting patents solely by finding prior art corollaries for the claimed elements would permit an Examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Such an approach would be "an illogical and inappropriate process by which to determine patentability." Sensonics, Inc. v. Aerosonic Corp., 81 F.3d 1566, 1570, 38 USPQ2d 1551, 1554 (Fed. Cir. 1996).

Thus, it is respectfully submitted that amended independent claims 1, 15, 24 and 27 are patentable under 35 U.S.C. §103(a) over Geronov et al. (USPN 6,344,293) and/or Takezawa et al. (USPN 6,733,927), alone or in combination. Since claims 4-5, 9-11, 14, 15, 17-22 and 25-26 depend from amended claims 1, 15, and 24, respectively, claims 4-5, 9-11, 14, 15, 17-22 and 25-26 are submitted to be patentable under 35 U.S.C. §103(a) over Geronov et al. (USPN

6,344,293) and/or Takezawa et al. (USPN 6,733,927), alone or in combination, for at least the reasons that amended claims 1, 15, 24 and 27 are submitted to be patentable under 35 U.S.C. §103(a) over Geronov et al. (USPN 6,344,293) and/or Takezawa et al. (USPN 6,733,927), alone or in combination.

B. In the Office Action, at page 3, claims 1, 4, 6, 9-11, 14-15, 17-22, 24-28, 30-32 and 34-35 were rejected under 35 U.S.C. §103(a) as being unpatentable over Nakagiri et al. (USPN 6,576,370; hereafter, Nakagiri) in view of Carlson (USPN 6,488,721; hereafter, Carlson). The reasons for the rejection are set forth in the Office Action and therefore not repeated. The rejection is traversed and reconsideration is requested.

Independent claim 1, and independent claims 15, 24, 27, 28 and 32 in similar fashion, have been amended to recite that the organic mixing solvent is non-aqueous and has a solubility of sulfur equal to or less than 50 mM, which is not taught or suggested by Nakagiri and/or Carlson, alone or in combination.

As noted by the Examiner (pages 8-9 of the Office Action), although Nakagiri teaches using a polyvinyl pyrrolidone binder, Nakagiri does not expressly disclose mixing the binder with isopropyl alcohol, employing at least five percent by weight of the binder or the electrolyte organic mixing solvent having a solubility of sulfur equal to or less than 50 mM. On page 9 of the Office Action, the Examiner relies on USPN 6,488,721 (Carlson) to suggest mixing the binder with isopropyl alcohol in the cathodic mixture. It is respectfully submitted that USPN 6,488,721 **teaches away** from using isopropyl alcohol **without using water, as in the present invention, because USPN 6,488,721 teaches coating a cathode with "water or a blend of water with an alcohol solvent, such as isopropyl alcohol or ethyl alcohol"** (emphasis added) since the materials **"are most compatible with a water-based, highly polar liquid carrier medium"** (col. 27, lines 4-7) (emphasis added).

The Examiner provides no reasons that one of ordinary skill in this art, seeking to improve the battery performance, would combine Nakagiri and Carlson in a manner that would provide an electrolyte organic mixing solvent having a solubility of sulfur less than or equal to 50 mM and that would render the claimed invention obvious.

As this court has stated, "virtually all [inventions] are combinations of old elements." Environmental Designs, Ltd. v. Union Oil Co., 713 F.2d 693, 698, 218 USPQ 865, 870 (Fed. Cir. 1983); see also Richdel, Inc. v. Sunspool Corp., 714 F.2d 1573, 1579-80, 219 USPQ 8, 12 (Fed. Cir. 1983) ("Most, if not all, inventions are combinations and mostly of old elements."). Therefore an Examiner may often find every element of a claimed invention in the prior art. If identification

of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue. Furthermore, rejecting patents solely by finding prior art corollaries for the claimed elements would permit an Examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Such an approach would be "an illogical and inappropriate process by which to determine patentability." Sensonics, Inc. v. Aerosonic Corp., 81 F.3d 1566, 1570, 38 USPQ2d 1551, 1554 (Fed. Cir. 1996).

Thus, it is respectfully submitted that amended independent claims 1, 15, 24, 27, 28 and 32 are patentable under 35 U.S.C. §103(a) over Nakagiri et al. (USPN 6,576,370) and/or Carlson (USPN 6,488,721), alone or in combination. Since claims 4, 6, 9-11, 14, 17-22, 25-26, 30-31 and 34-35 depend from amended claims 1, 15, 24, 28, and 32, respectively, claims 4, 6, 9-11, 14, 17-22, 25-26, 30-31 and 34-35 are submitted to be patentable under 35 U.S.C. §103(a) over Nakagiri et al. (USPN 6,576,370) and/or Carlson (USPN 6,488,721), alone or in combination, for at least the reasons that amended claims 1, 15, 24, 27, 28, and 32 are submitted to be patentable under 35 U.S.C. §103(a) over Nakagiri et al. (USPN 6,576,370) and/or Carlson (USPN 6,488,721), alone or in combination.

C. In the Office Action, at page 3, claim 13 was rejected under 35 U.S.C. §103(a) as being unpatentable over Geronov et al. (USPN 6,344,293; hereafter, Geronov) in view of Takezawa et al. (USPN 6,733,927; hereafter, Takezawa), as applied to claims 1 and 5 above, and further in view of Semel et al. (USPN 5,298,055; hereafter, Semel). The reasons for the rejection are set forth in the Office Action and therefore not repeated. The rejection is traversed and reconsideration is requested.

As noted above, amended claim 1 is submitted to be patentable under 35 U.S.C. §103(a) over Geronov et al. (USPN 6,344,293) and/or Takezawa et al. (USPN 6,733,927), alone or in combination.

Semel teaches using an organic binder having at least 40% of a polyalkylene oxide and fails to teach or suggest using an organic mixing solvent that is non-aqueous and has a solubility of sulfur equal to or less than 50 mM, as is recited by the present claimed invention.

The Examiner provides no reasons that one of ordinary skill in this art, seeking to improve the battery performance, would combine Geronov and/or Takezawa et al. and/or Semel in a manner that would provide an electrolyte organic mixing solvent having a solubility of sulfur less than or equal to 50 mM and that would render the claimed invention obvious.

As this court has stated, "virtually all [inventions] are combinations of old elements." Environmental Designs, Ltd. v. Union Oil Co., 713 F.2d 693, 698, 218 USPQ 865, 870 (Fed. Cir. 1983); see also Richdel, Inc. v. Sunspool Corp., 714 F.2d 1573, 1579-80, 219 USPQ 8, 12 (Fed. Cir. 1983) ("Most, if not all, inventions are combinations and mostly of old elements."). Therefore an Examiner may often find every element of a claimed invention in the prior art. If identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue. Furthermore, rejecting patents solely by finding prior art corollaries for the claimed elements would permit an Examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Such an approach would be "an illogical and inappropriate process by which to determine patentability." Sensonics, Inc. v. Aerosonic Corp., 81 F.3d 1566, 1570, 38 USPQ2d 1551, 1554 (Fed. Cir. 1996).

Thus, it is respectfully submitted that claim 13 is patentable under 35 U.S.C. §103(a) over Geronov et al. (USPN 6,344,293) and/or Takezawa et al. (USPN 6,733,927), as applied to claims 1 and 5 above, and/or Semel et al. (USPN 5,298,055), alone or in combination.

D. In the Office Action, at page 4, claim 8 was rejected under 35 U.S.C. §103(a) as being unpatentable over Nakagiri et al. (USPN 6,576,370; hereafter, Nakagiri) in view of Carlson (USPN 6,488,721; hereafter, Carlson), as applied to claim 1 above, and further in view of Igarashi et al. (USPN 6,573,004; hereafter, Igarashi). The reasons for the rejection are set forth in the Office Action and therefore not repeated. The rejection is traversed and reconsideration is requested.

As noted above, amended claim 1 is submitted to be patentable under 35 U.S.C. §103(a) over Nakagiri et al. (USPN 6,576,370) and/or Carlson (USPN 6,488,721), alone or in combination.

Igarashi teaches using a polyvinyl acetate in the cathodic mixture. However, Igarashi fails to teach or suggest using an organic mixing solvent that is non-aqueous and has a solubility of sulfur equal to or less than 50 mM, as is recited by the present claimed invention.

The Examiner provides no reasons that one of ordinary skill in this art, seeking to improve the battery performance, would combine Geronov and/or Takezawa et al. and/or Semel in a manner that would provide an electrolyte organic mixing solvent having a solubility of sulfur less than or equal to 50 mM and that would render the claimed invention obvious.

As this court has stated, "virtually all [inventions] are combinations of old elements." Environmental Designs, Ltd. v. Union Oil Co., 713 F.2d 693, 698, 218 USPQ 865, 870 (Fed. Cir.

1983); see also Richdel, Inc. v. Sunspool Corp., 714 F.2d 1573, 1579-80, 219 USPQ 8, 12 (Fed. Cir. 1983) ("Most, if not all, inventions are combinations and mostly of old elements."). Therefore an Examiner may often find every element of a claimed invention in the prior art. If identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue. Furthermore, rejecting patents solely by finding prior art corollaries for the claimed elements would permit an Examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Such an approach would be "an illogical and inappropriate process by which to determine patentability." Sensonics, Inc. v. Aerosonic Corp., 81 F.3d 1566, 1570, 38 USPQ2d 1551, 1554 (Fed. Cir. 1996).

Thus, it is respectfully submitted that claim 8 is patentable under 35 U.S.C. §103(a) over Nakagiri et al. (USPN 6,576,370) and/or Carlson (USPN 6,488,721) as applied to claim 1 above, and/or Igarashi et al. (USPN 6,573,004), alone or in combination.

CONCLUSION:

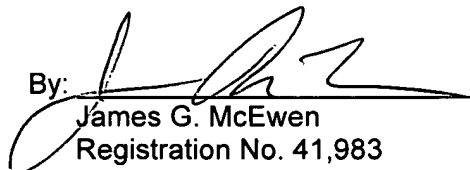
In accordance with the foregoing, it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot, and further, that all pending claims patentably distinguish over the prior art. Thus, there being no further outstanding objections or rejections, the application is submitted as being in condition for allowance which action is earnestly solicited.

If the Examiner has any remaining issues to be addressed, it is believed that prosecution can be expedited by the Examiner contacting the undersigned attorney for a telephone interview to discuss resolution of such issues. If there are any underpayments or overpayments of fees associated with the filing of this Amendment, please charge and/or credit the same to our Deposit Account No. 503333.

Respectfully submitted,

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